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EVALUATION OF PITCH CANKER AND FUSIFORM RUST IN THE STUART SEED ORCHARD POLLOCK, LOUISIANA 1983

by

Dale A. Starkey, Charles E. Affeltranger,[1/]
Steven A. Covington[2/]

Abstract

A systematic row survey of selected seed sources revealed an incidence of pitch canker in affected sources, ranging from 8.2% in Louisiana longleaf to 12.1% in Texas shortleaf. Fusiform stem canker incidence in affected sources ranged from 3.9% in Texas loblolly to 16.0% in Louisiana slash. Clonal differences in pitch canker incidence were readily apparent while those for stem rust were less so.

INTRODUCTION

Pitch canker of southern pines, caused by the fungus Fusarium moniliforme Sheld var. subglutinans Wr. and Reink. is an intermittently damaging disease of forest stands (Blakeslee and Oak 1979, Phelps and Chellman 1976), seed orchards (Dwinell and others 1977, Phelps and Chellman 1976) and forest nurseries (Barnard and Blakeslee 1980). Potential to damage flowers, cones, and seed has been demonstrated for slash and loblolly pines (Miller and Bramlett 1979).

[1/] Plant Pathologists, USDA Forest Service, Southern Region, State and Private Forestry, Forest Pest Management, Alexandria Field Office, Pineville, LA.

[2/] Biological Technician, USDA Forest Service, Southern Region, State and Private Forestry, Forest Pest Management, Alexandria Field Office, Pineville, LA.

Many species of southern pine are susceptible to pitch canker infection. Slash, shortleaf and Virginia pine are highly susceptible. Loblolly is less susceptible (Dwinell 1978). Most research work has been performed on slash and loblolly pine in plantations and seed orchards.

Effects of pitch canker outbreaks in southern pine seed orchards are not yet fully understood. In addition to shoot damage, reduced cone/seed production has been reported by some (Dwinell and others 1977), while bumper crops have occurred during a pitch canker outbreak (Kuhlman and others 1982).

Clonal variation in susceptibility is known to exist in loblolly pine (Kuhlman and others 1982; Kelly and Williams 1982) and slash pine (Phelps and Chellman 1976).

The most serious effect of a pitch canker outbreak in a seed orchard may not be shoot mortality but the reduction in cone and seed yield and the reduction in seed quality in highly susceptible clones.

Fusiform rust caused by the fungus Cronartium quercuum (Berk.) Miy. ex Shirai f. sp. fusiforme is the most serious disease of southern pines. In seed orchards the disease causes the loss of ramets due to stem breakage at cankers and the loss of ramet utility due to branch and stem deformations. The inherent resistance or susceptibility of orchard trees is of course passed on to progeny through seed production.

The objectives of this evaluation were to determine the incidence and severity of pitch canker and fusiform rust in the Stuart Seed Orchard and document any differences among species, seed sources and clones.

METHODS

A systematic row survey of the following seed sources at the Stuart Seed Orchard, Pollock, La. was performed at the indicated level:

Seed Source	Rows Surveyed	%
Louisiana Loblolly	Every 5th	20
Texas Loblolly	Every 5th	20
Louisiana Slash	Every other	50
Louisiana Shortleaf	Every 5th	20
Texas Shortleaf	Every 5th	20
Louisiana Longleaf	Every 5th	20
Texas Longleaf	All	100

Each ramet in surveyed rows was observed from all four sides by two observers and jointly rated for the following:

Pitch Canker

Rating K

1 = above
2 = 1-3 lateral branches
3 = terminal
4 = terminal and 1-3 laterals
5 = 5-10 branches
6 = > 10 branches < 50% of crown
7 = > 50% of crown
8 = dead due to PC

Rating F

1 = None
2 = 1-10% diseased
3 = 11-20% diseased
4 = 21-30% diseased
5 = 31-40% diseased
6 = 41-50% diseased
7 = > 50% diseased
8 = dead

Fusiform Rust

- Number of stem cankers
- Position of each canker: 1 = lower 1/3 bole; 2 = middle 1/3 bole; 3 = upper 1/3 bole
- Percent girdle each canker
- Number of branch galls within 15" of bole

Miscellaneous

Dioryctria sp. (coneworm) attack was recorded

Rating K is a modification of the system of Kuhlman and others (1982). The others were devised for this survey by us.

RESULTS

Pitch Canker

Pitch canker was found to be at a generally low level throughout the orchard (table 1). Only 3 seed sources were affected; Texas shortleaf (12.1%), Texas longleaf (8.9%) and Louisiana longleaf (8.3%). About one-half of the clones were affected in each seed source. Severity varied little between seed sources and was mostly light except for a few ramets. However, the K rating caused slightly greater separation in the sources.

Damage was found occurring in the greatest number of clones in the Louisiana longleaf with 58% of the clones affected compared to 46% in Texas longleaf.

Affected clones are listed by seed source in table 2 according to the incidence in each. Susceptibility groupings were assigned by examining a Duncan's multiple range analysis of disease incidence for 3 orchards and utilizing natural "groups" occurring at the P = 0.01 level. Unlisted clones were found to be disease-free.

Fusiform Rust

Fusiform rust was also found to be at a generally low level (table 1). Incidence was recorded as Louisiana slash (16.0), Louisiana loblolly

Table 1. Incidence (percent of trees infected) and Severity of Pitch Canker and Fusiform Rust at the Stuart Seed Orchard, Pollock, Louisiana, 1983.

Seed Source or Species	Pitch Canker				Fusiform Rust				
					Stem Canker				Branch Canker
	Incidence	% Clones Diseased	$\bar{x}$ Rating K	$\bar{x}$ Rating F	Incidence	% Clones Diseased	$\bar{x}$ No. Cankers	Ave % Girdle	Incidence
Texas *Shortleaf*	12.1	46.9	3.1	2.1					
Texas Longleaf	8.9	46.0	3.3	2.3					
Louisiana *Longleaf*	8.3	58.0	3.5	2.2					
Louisiana Slash					16.0	22	1.2	45	8.0
Louisiana *Loblolly*					6.3	38	1.0	46	1.2
Texas Loblolly					3.9	44	1.1	46	1.2

Table 2. Incidence (percent of trees infected) of Pitch Canker by Clone and Seed Source at the Stuart Seed Orchard, Pollock, Louisiana, 1983.

	Texas Shortleaf		Texas Longleaf		Louisiana Longleaf	
	Clone	Incidence	Clone	Incidence	Clone	Incidence
High	31	66.7				
Medium	38	50.0	6	62.5	12	33.3
	39*	50.0	7	45.5	13	30.0
	49*	50.0	47	38.5	41	28.6
	42	37.5	41	33.3	48	25.0
	10	33.3	49	30.8	3	23.1
	43	33.3	40	21.4		
	34	30.0				
	3	25.0				
	5	25.0				
	8	25.0				
	26	25.0				
	40	25.0				
	41	25.0				
	13	22.2				
	25	22.2				
	29	22.2				
Low	37	16.7	20	18.2	15	20.0
	47	16.7	46	18.2	29	18.2
	46	14.3	17	14.3	4	16.7
	44	12.5	22	14.3	16	16.7
	23	10.0	23	12.5	19	16.7
	50	10.0	31	12.5	40	15.4
			29	10.0	42	14.3
			3	7.7	39	12.5
			42	7.7	45	12.5
			48	7.7	18	11.1
			27	7.1	34	10.0
			1	6.7	17	9.1
			11	6.7	30	9.1
			16	6.7	7	8.3
			25	6.7	24	8.3
			50	6.7	25	8.3
			14	6.3	31	8.3
					44	8.3
					1	7.7
					2	7.7
					21	7.7
					50	7.7
					11	7.1
					26	7.1

*limited observations

(6.3) and Texas loblolly (3.9%). The proportion of affected clones was greatest in Texas loblolly at 44% and least in Louisiana slash with 22%. Average percent girdle was rather uniform between sources at about 46%.

A few clones had more rust cankers than others (table 3) but differences were not great.

Incidence of branch rust was very low in the loblolly sources and only 8% in Louisiana slash.

DISCUSSION

Since pitch canker is currently at a low level in the orchard and damage is mostly light, roguing and pruning should serve to remove or rehabilitate damaged trees (Blakeslee et al. 1980). This should reduce the inoculum levels of the fungus in the orchard and aid in limiting further infections.

The effect of pitch canker infection on cone and seed yield in the orchard is currently unknown. No doubt severely damaged ramets may suffer a yield reduction. However, since incidence is low and the number of severely diseased trees is small, overall production is probably little affected. During an epidemic, though, reductions in yield might occur.

Susceptibility to pitch canker is generally indicated by incidence and percent clones affected for seed source and by incidence for clones within sources. However, since incidence is rather low and damage light it is likely that the relative susceptibility or resistance may not be fully expressed by each clone. With a higher disease level in the orchard, some clones with apparent resistance might have sustained more infection while others remained unaffected more accurately expressing resistance.

Fusiform rust stem cankering was most prevalent in the Louisiana slash seed source as was expected (16% incidence). However, only 22% of the clones in that source were affected (the smallest proportion) indicating that many clones may have some resistance. Conversely, 44% of the Texas loblolly clones had some infection, but a small overall number (3.9%) of ramets were diseased. Many clones were infected but not a great many trees. This is probably a reflection of the generally lower susceptibility of loblolly as a species. The average percent girdle among seed sources was remarkably uniform, at about 46% suggesting that once infected any tree is equally in danger of total girdling.

A few clones had more stem cankers than others, but since the numbers were so low and the difference not great, it can only be viewed as a very general indicator of susceptibility.

The higher incidence of branch cankering occurring in the Louisiana slash seed source agrees with the stem canker incidence and was not unexpected. The overall low incidence of branch canker suggests it is not currently a

Table 3. Number of Stem Cankered Ramets by Clone and Seed Source at the Stuart Seed Orchard, Pollock, Louisiana, 1983.

Louisiana Slash		Louisiana Loblolly		Texas Loblolly	
Clone	No. of Cankered Ramets	Clone	No. of Cankered Ramets	Clone	No. of Cankered Ramets
14	2 (2 cankers on each)	9	3	6	3 (2 with 2 cankers)
3	1	17	3	16	2
6	1	33	3	25	2
20	1	25	2	27	2
28	1	34	2	39	2
33	1	1	1	6	1
34	1	2	1	7	1
35	1	5	1	8	1
37	1	15	1	11	1
47	1	22	1	12	1
50	1	28	1	19	1
		31	1	23	1
		32	1	26	1
		34	1	28	1
		39	1	32	1
		43	1	37	1
		44	1	40	1
		46	1	41	1
		47	1	43	1
		49	1	45	1
				47	1
				49	1
				50	1

major problem, however, most stem cankers were probably initiated as branch cankers. Branch cankers (within 12 inches of the trunk) on healthy trees with no stem cankers should be pruned.

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Prepared by: Dale Starkey
Pathologist

Charles Affeltranger
Pathologist

Stephen A. Covington
Biological Technician

Approved by:
for HARVEY V. TOKO
Staff Director
Forest Pest Management

SOUTHERN REGION, STATE AND PRIVATE FORESTRY
USDA, FOREST SERVICE, ATLANTA, GA 30367